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Reports
Hazlett,
Donald L.

The Discovery of *Spiranthes diluvialis* along the Niobrara River in Wyoming and Nebraska

Final Report

Donald L. Hazlett



Submitted to:

**Bureau of Land Management
Wyoming State Office
Attn: Jeff Carrol/botanist
Cheyenne, Wyoming**

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The Discovery of *Spiranthes diluvialis* along the Niobrara River in Wyoming and Nebraska

Introduction

Spiranthes diluvialis Shev. (Orchidaceae) or Ute Lady's tresses orchid is a rare plant that is listed by the United States Fish and Wildlife service as a threatened plant species. This orchid is known to occur on state lands in Wyoming, but has yet to be located on Bureau of Land Management (BLM) lands in Nebraska or Wyoming. The Wyoming BLM state office has been keenly aware of the possibility that this orchid could occur on lands in their jurisdiction and has been very active in supporting search efforts to locate this orchid on BLM or on nearby state or private lands in Wyoming and in Nebraska.

This final report marks the end of a two year contract to search for new populations of *Spiranthes diluvialis* in Wyoming and Nebraska. The 1995 preliminary report (October, 1995) indicated that seven days of intensive searching in southeastern Wyoming did not locate any new populations of this orchid. However, during August of 1996 several new populations of this orchid were discovered along the Niobrara river in Niobrara County, Wyoming and Sioux County, Nebraska.

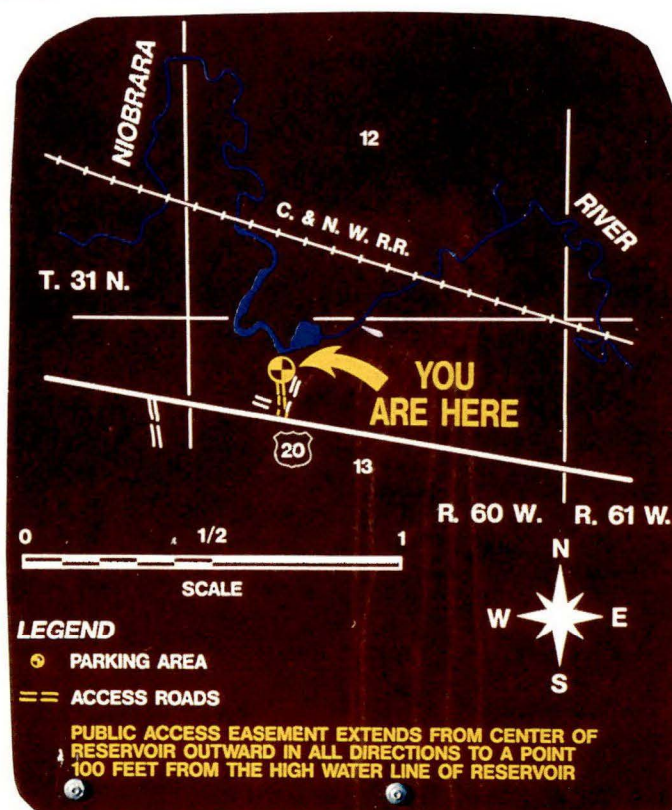
Methods

Before beginning the 1996 search a meeting was arranged with Ernie Nelson, manager of the Rocky Mountain Herbarium. Personnel from Rocky Mountain Herbarium have been actively searching for additional populations of *S. diluvialis* in eastern Wyoming for several years. Nelson is the botanist who discovered the initial Wyoming population of *S. diluvialis* in Goshen county. He also located a second population of this orchid in Natrona county. After a consultation with Nelson and a study at the Rocky Mountain Herbarium of a detailed map of riparian areas in southeastern Wyoming that had already been searched, it was clear that Nelson and I had already surveyed many of the potential *Spiranthes* habitats in Laramie, Platte and Goshen counties.

It was decided that the next phase in the search was to expand further out from the known locations of this orchid. Nelson further indicated that he had noticed potential *Spiranthes* habitats along the Niobrara river area, near Van Tassel, Wyoming. However, he had not yet had the opportunity to search these for *Spiranthes* during the appropriate time of year. The appropriate time is when this orchid flowers, from late July to late August. For this reason, the 1996 search began along the Niobrara river.

In 1996 a total 6 days were spent in the field searching for *Spiranthes*. It was fortunate that this orchid was located late during the first day of searching. The remaining 5 days were spent searching other portions of the Niobrara River in both Wyoming and Nebraska.

Voucher specimens of this orchid and of other plant species in *Spiranthes* habitats were collected only after permission to collect had been obtained from land owners or land managers.



Photos 1 and 2. Overview of the Niobrara River as seen from the parking area of the McMaster Reservoir Public Access Area. *Spiranthes diluvialis* occurs along the river within 0.5km on either sides of the location where the C. & N. W. railroad trellis crosses the river.



Photo 3. Close up of *S. diluvialis* near McMaster Reservoir on August 17, 1996. Notice the earlier stage of flowering when compared to the August 24 photograph (Photo 4)

All collected plant specimens were identified at the Rocky Mountain Herbarium, University of Wyoming, Laramie. One specimen of each species will be deposited into this herbarium. In addition, one voucher specimen of the August 24 collection of *Spiranthes diluvialis* from Nebraska was sent to William Jennings, an orchid specialist. He confirmed the identification of these plants as the *S. diluvialis*. The sheet examined by Jennings was deposited into the University of Colorado herbarium in Boulder, Colorado. One additional sheet of the August 24 *Spiranthes diluvialis* collection will be given to the Rocky Mountain Herbarium for possible distribution to an appropriate herbarium in Nebraska.

***Spiranthes diluvialis* in Niobrara County, Wyoming**

On August 16, 1996 five individuals of *Spiranthes diluvialis* were located near the public access area of McMaster's Reservoir (Photos 1, 2 and 3). These plants were in Section 13, but were within a few yards of the boundary between sections 12 and 13. Entrance to this reservoir is 2.5 miles west of Van Tassel, Wyoming. The owner of this property, Norma Bruegger of Van Tassel, was very interested to learn of this orchid on her property. I showed her and other members of her family the location of these 5 individuals. Norma's niece, Krista Bruegger, was also very interested in learning more about this orchid. I sent Krista the 1995 Wyoming Wildlife article and encouraged her to adopt, as a long-term project, the annual relocation of this orchid. As a local resident, she could easily check this location during middle of August each year to see if these individuals appear every year.

Once this first population was located, the landowners of the neighboring properties were contacted. Permission was obtained to search along the Niobrara river that passed through the property of Dale and Eunice Miller, adjacent to and east of McMaster Reservoir. On the Miller property *Spiranthes diluvialis* was located in four different locations: in sections 7 and 18 (T31N/R60W) and in section 13 (T31N/R61W). The number of individuals seen at these four locations was 2, 4, 6 and 40 individuals. Combined with the 5 individuals on the Bruegger property a total of 57 *Spiranthes diluvialis* plants were located along this Wyoming stretch of the Niobrara river. With permission from Eunice Miller, one individual from the population of 40 was collected for a herbarium voucher (housed at Rocky Mountain Herbarium, University of Wyoming, Laramie, Wyoming).

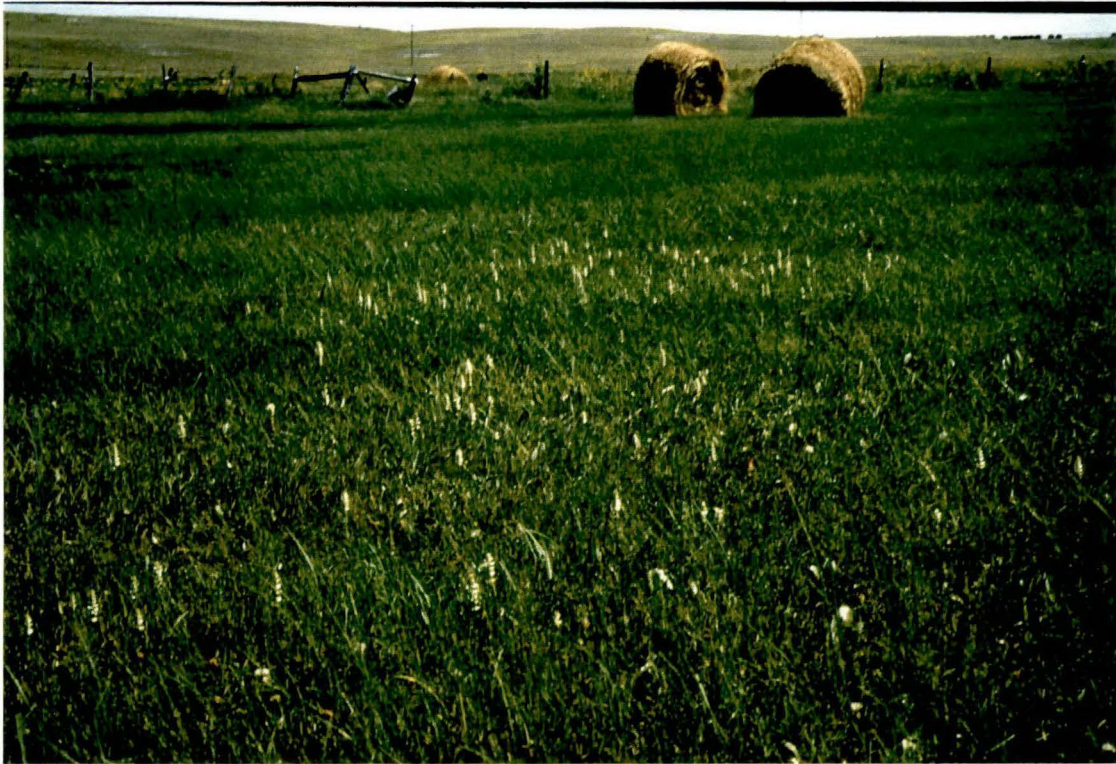
Both of these land owners graze the riparian areas near the Niobrara River. In August grazing had been discontinued in the Bruegger property, while grazing on the Miller property continued to be moderate. The effects of grazing and climate, such as the high rainfall during 1995, may have both contributed to the survival and success of these orchid populations.

***Spiranthes diluvialis* in Sioux County, Nebraska**

On August 24, 1996 permission was requested to collect plants along a remote portion of the Niobrara River in Sioux County, Nebraska. The land manager was hesitant to grant permission to search on this property. The reason for his hesitance was understandable.



Photo 4. Close up of *S. diluvialis* along the Niobrara River in Nebraska. This photograph was taken on August 24. Notice the later development stage of the inflorescence when compared with the photograph from Wyoming on August 17 (Photo 3).



Photos 5 and 6. Large, level mown grass field near the Niobrara River in Nebraska (top photograph). The lower photograph in one of many similar areas in these fields where several hundred flowering *S. diluvialis* are visible from a single location. Photographs were taken on August 24, 1996.

Apparently, a biologist from a Nebraska government agency had studied a Swift fox den without permission. It was indicated that a female fox was trapped or at least scared away from its den. Apparently Swift foxes have not been seen on the property after an unauthorized visit to a den by this wildlife biologist. Eventually, I was granted permission to search and to collect plants on this property. However, I honor the land owner's request and do not disclose the exact location of this area in this report or on the herbarium tags.

Spiranthes diluvialis Shev. did occur on this property (Photo 4)! Several thousand individuals were counted and perhaps as many as 4,000 occur in this area (Photo 5). This is arguably the largest known population of *Spiranthes diluvialis* that has yet been discovered. This section of the Niobrara River was mown in July, 1996 for hay and on August 24 the bales were still in the field (Photo 6).

This discovery (Hazlett 9541) was the first report of *Spiranthes diluvialis* in the state of Nebraska. There are now three threatened or endangered plant species in Nebraska. The other two are *Platanthera praeclara* Sheviak & Bowles (Orchidaceae), the Great Plains white fringed orchid and *Penstemon haydenii* S. Wats. (Scrophulariaceae), Hayden's penstemon. These names were provided by Jerry Steinhauer of the Nebraska Game and Parks Commission/Natural Heritage Program when he was notified that *S. diluvialis* is now known to occur in Nebraska.

It is very likely that current management of this riparian area for hay has resulted in an increased abundance of *Spiranthes diluvialis* plants at this location. First, the area is flooded in early spring, mostly by natural means. Then the area is mown in mid to late July. The mowing of taller grass vegetation, including the naturalized (perhaps planted?) *Elymus elongatum* (tall wheatgrass) and *Phlaris arundinacea* L. (reed canary grass), allows for the shorter orchid plants to grow. The timing is such that this orchid can flower and fruit in August and September before cattle are allowed to enter and to graze in this area in October. Other evidence that this management has enhanced the orchid population is that adjacent and nearby portions of this river were also searched. In these other areas there had been no mowing or mowing had been done later, in mid-August. *Spiranthes* was not located in any of these adjacent areas.

If the current mowing and grazing schedule is maintained, the long-term survival of *S. diluvialis* along the Niobrara River in Nebraska appears to be excellent. Thousands of plants were present. Furthermore, this area is destined to eventually become a working ranch or nature preserve/camp for young people. The presence of this unique orchid will be an excellent addition to the natural history education associated with this nature preserve. Bill Whittney from Aurora, Nebraska is aware of this future use for this area for a youth camp/ranch and has been informed of the presence of this orchid.



Photos 7 and 8. Overview of *S. diluvialis* habitat and of the Niobrara river on the Bruegger (top) and the Miller (bottom) properties in Niobrara County, Wyoming (August 17, 1996).



Photos 9 and 10. View of the habitat and species associated with *S. diluvialis* along the Niobrara River in Wyoming. In the lower photograph the associated *Juncus balticus*, *Triglochin maritimum*, *Scirpus pungens* and *Agrostis stolonifera* can be seen near *Spiranthes diluvialis*.

Vegetation associated with Niobrara River populations of *Spiranthes diluvialis*

The habitat of *S. diluvialis* along the Niobrara in Wyoming is the strip of flooded vegetation outward from the *Typha* or *Sparganium* dominated marsh vegetation (Photo 7 and 8). This strip can be as narrow as 3 meters and, when the river makes horseshoe bends, can include the entire area enclosed by the bend.

Thirty-eight (38) plant species that were growing in association with *Spiranthes diluvialis* populations in Wyoming were collected (Table 1). The most abundant plant species associated with this orchid, accounting for an estimated over 75% of the habitat biomass, was *Juncus balticus*. Other species that were common near the *Spiranthes* individuals, but that were not as overwhelmingly abundant, included *Eleocharis pauciflora*, *Melilotus alba*, *Triglochin maritimum*, *Scirpus pungens* and *Agrostis stolonifera*. Exotic plant species growing in this area included *Agrostis stolonifera*, *Hordeum jubatum* and *Melilotus alba*. None of these exotic plants occurred in great enough abundance to threaten native plant populations. All of the remaining plant species on Table 1 were of sporadic occurrence along the margins of the Niobrara river. One county record from these associated species was *Pedicularis cremulata* (Scrophulariaceae).

In Nebraska only 20 plant species were recorded as associated with *Spiranthes diluvialis* (Table 2). A main difference between the Wyoming and the Nebraska populations of *Spiranthes* was that in Nebraska individuals at a distance of 40-60m away from the river channel. In contrast, all of the individuals in Wyoming were within 1-10m of the river. This difference was, in part, because the terrain near the river in Nebraska was much more level. The wide level areas along the river allowed spring flood waters to cover a greater area. Plant species located among the Nebraska population of *Spiranthes diluvialis*, but not near the Wyoming population, were *Elymus elongatus*, *Phlaris arundinacea*, *Plantago eriopoda* and *Spartina gracilis*. In both locations the list of associated plant species should not be considered to be comprehensive lists. Plant species that appear to consistently occur with *Spiranthes diluvialis* include *Melilotus alba*, *Triglochin maritimum*, *Sisyrinchium montanum*, *Agrostis stolonifera*, *Equisetum larvigatum* and *Juncus* spp. For the Niobrara river, *Agalinis tenuiflora* also seems to be a possible indicator of *Spiranthes diluvialis* habitat.

Geographic Distribution of *Spiranthes diluvialis*

The geographic distribution and the number of known populations of *Spiranthes diluvialis* has increased dramatically over the past 5 years (Map 1). There were 10 populations of *Spiranthes diluvialis* known from three states (Colorado, Nevada and Utah) before 1992 (indicated as stars on Map 1). Since 1992, approximately the time when this taxon was federally listed as threatened, another 10 locations of this orchid has been discovered, including populations in 3 more states (Wyoming, Montana and Nebraska). In summary, *Spiranthes diluvialis* is currently known now known to occur in at least 20 locations across six states.

Table 1. Plant species growing in association with the Niobrara river populations of *Spiranthes diluvialis* located Van Tassel, Niobrara County, Wyoming.

Alismataceae

Alisma trivale Pursh 9580

Apiaceae

Sium suave Walt. 9579

Asteraceae

Aster falcatus Lindl. var. *falcatus* 9544

Bidens comosa (Grey) Wieg. 9553

Bidens frondosa L. 9554

Solidago canadensis L.

var. *gilvocanescens* Rydb.

Sonchus uliginosus Bieb. 9564

Brassicaceae

Thelypodium integrifolium (Nutt.) Endl.
ex Walpers 9573

Chenopodiaceae

Atriplex subspicata (Nutt.) Rydb. 9574

Chenopodium rubrum L. var. *rubrum*

Suaeda calceoliformis (Hook.) Moq. 9562

Cyperaceae

Carex nebrascensis Dewey 9548

Eleocharis pauciflora (Lightf.) Link
(syn.= *E. quinqueflora*) 9549

Scirpus pungens Vahl.

var. *polyphyllus* Boeckler 9541

Scirpus validus Vahl. 9569

Equisetaceae

Equisetum laevigatum A. Br. 9561

Fabaceae

Glycyrrhiza lepidota Pursh 9556

Melilotus alba Medic 9558

Iridaceae

Sisyrinchium montanum Greene 9543

Juncaceae

Juncus balticus Willd. 9550

Juncus longistylis Torrey 9546

Juncus torreyi Cov. 9557

Juncaginaceae

Triglochin maritimum L.

var. *elatum* (Nutt.) Gray 9572

Lamiaceae

Lycopus asper L. 9545

Stachys palustris L.

var. *pilosa* (Nutt.) Fern 9578

Onagraceae

Epilobium palustre L.

var. *gracile* (Farw.) Dorn 9542

Orchidaceae

Spiranthes diluvialis Shev. 9538

Poaceae

Agrostis stolonifera L. 9547

Echinochloa muricata (Beauv.) Fern.

var. *microstachya* Wieg. 9570

Elymus repens (L.) Gould

Hordeum jubatum L. 9552

Polygonaceae

Polygonum ramosissimum Michx. 9575

Ranunculaceae

Ranunculus cymbalaria Pursh

var. *cymbalaria* 9567

Rubiaceae

Galium trifidum L. 9566

Salicaceae

Salix sp.

Scrophulariaceae

Agalinis tenuifolia (Vahl.) Raf.

var. *parviflora* (Nutt.) Pennel 9560

Orthocarpus luteus Nutt. 9571

Pedicularis crenulata Benth. 9559

Sparganiaceae

Sparganium emersum Rehm

Typhaceae

Typha latifolia L.

Table 2. Plant species growing in association with *Spiranthes diluvialis* populations in Sioux County, Nebraska.

Asteraceae

Aster ericoides L. 9636

Bidens frondosa L.

Sonchus uliginosus Bieb. 9639

Chenopodiaceae

Atriplex subspicata (Nutt.) Rydb. 9574

Cyperaceae

Carex nebrascensis Dewey 9548

Scirpus validus Vahl.

Equisetaceae

Equisetum laevigatum A. Br.

Fabaceae

Glycyrrhiza lepidota Pursh 9633

Melilotus alba Medic

Iridaceae

Sisyrinchium montanum Greene

Juncaceae

Juncus balticus Willd.

Juncaginaceae

Triglochin maritimum L.

var. *elatum* (Nutt.) Gray 9638

Lamiaceae

Lycopus asper L. 9635

Orchidaceae

Spiranthes diluvialis Shev. 9541 & 9648

Plantaginaceae

Plantago eriopoda Torrey 9637

Poaceae

Agrostis stolonifera L.

Elymus elongatus (Host) Runem. 9634

Phlaris arundinacea L. 9632

Spartina gracilis Trin 9642

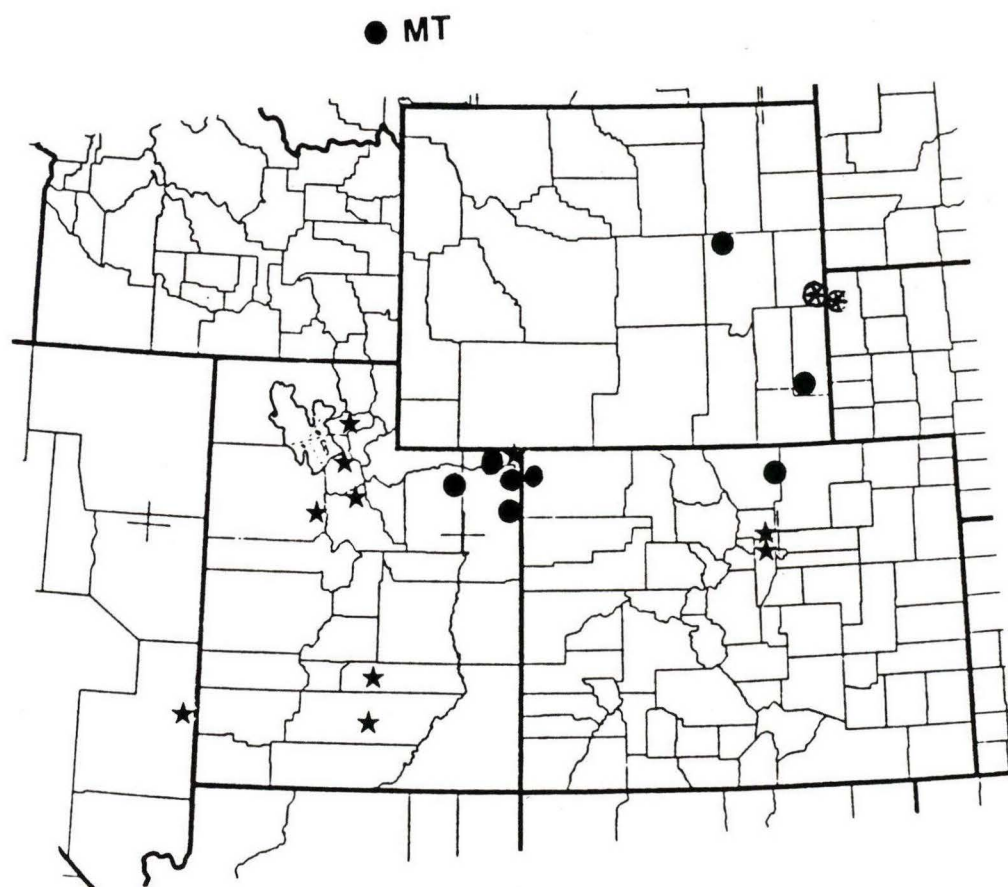
Scrophulariaceae

Agalinis tenuifolia (Vahl.) Raf.

var. *parviflora* (Nutt.) Pennel 9640

Typhaceae

Typha latifolia L.



Map 1. General locations of the 20 known populations of *Spiranthes diluvialis* in six states. Stars are locations known before 1991 and black dots are locations discovered since 1992. The location of the new populations reported here are indicated by an asterisk that is circled. The map is used by permission from Ronald Hartman, Rocky Mountain Herbarium.

Summary

It is clear that the listing of *Spiranthes diluvialis* as a federally threatened plant species has prompted additional searches for this species. A consequence of these searches has been that this taxon is now known from approximately twice as many populations and from twice as many states as it was before. In terms of management, it appears that certain types of grazing and mowing regimes have favored the survival of this species along the Niobrara river, an observation that has also been made for Colorado populations of this orchid. It is not known, however, if changes in the current grazing and mowing practices along the Niobrara or elsewhere would permanently affect these populations. Basic population biology questions also remain regarding pollination mechanisms and seedling establishment success of this orchid. It was noticed that bumble bees were visiting *Spiranthes diluvialis* flowers in the Nebraska population. Continual monitoring of the *S. diluvialis* populations along the Niobrara river is recommended to determine annual variations in the numbers of individuals, variations that could be linked to climate and/or to management practices.

Future Work

Future searches in this area in Nebraska should include the Niobrara River from McMaster Reservoir west toward Lusk. Searches should also be made of Duck Creek and the Cheyenne River. In Nebraska, searches should be made of grazed and mown sections of the Niobrara River from the Wyoming border eastward, at least to Marsland, including Barngrover and Whistle Creeks. In the center of this potential search area the Niobrara river passes through Agate Fossil Beds National Monument. Marten Schmitz is the park ranger for this National Monument. He has been contacted as is aware that this threatened plant species may occur on Monument land.

Appendix I. Areas searched for *Spiranthes diluvialis* during 1996 where no populations were encountered.

I. Unsuccessful 1996 Searches for *Spiranthes* in Wyoming

Date	County	Location	Ownership	Permission
8/16	Laramie	T15N/R63W/29	Private	Yes
Notes: Along this heavily grazed portion of Lodgepole Creek there were 20-30 Individuals of <i>Guara neomexicana</i> Woot. ssp. <i>coloradensis</i> (Munz) Raven & Gregory (Onagraceae). Other noteworthy plants growing along the creek were <i>Leersia oryoides</i> (L.) Sw (Poaceae) and <i>Potentilla anserina</i> L. (Rosaceae).				
8/24	Niobrara	T31N/R60W/9,16	Private	Yes
Notes: This was also Norma Bruegger's property. The area searched was along Van Tassel Creek. An infrequent plant along this section of Van Tassel Creek was <i>Bidens vulgata</i> Greene (Asteraceae).				
9/16	Niobrara	T31N/R61W/11,12	Private	Yes
Notes: This was also Norma Bruegger's property. The Niobrara river in these sections was searched with Jeff Carrol. Large patches of <i>Sparganium emersum</i> Rehm. (Sparganiaceae) occur along this portion of the Niobrara River. Since <i>Spiranthes</i> is difficult to see when not in flower and because this was appropriate habitat, it is suggested that this area be searched again in mid-August to be certain that <i>Spiranthes</i> does not occur here.				

II. Unsuccessful 1996 Searches for *Spiranthes* in Nebraska

Date	County	Location	Ownership	Permission
9/17	Sioux, NE	Niobrara River 0.5 km SE of where Hwy 20 crosses WY/NE line	Private	Yes
9/24	Sioux, NE	Niobrara River 13 km SSE of Harrison, NE	Private	Yes
9/24	Sioux, NE	Niobrara River 27 km S of Harrison, NE	Private	Yes

Appendix II. Copies of the information on the herbarium tags. These tags accompanied the voucher specimens that were sent to the University of Colorado and the University of Wyoming herbaria.

WYOMING

Niobrara County

Orchidaceae

Spiranthes diluvialis Shev.

Ute lady's tresses orchid

Sporadic occurrence along Niobrara River: west of Van Tassel about 2 air miles. On property of Dale & Eunice Miller. T31N & R61W (Sec. 12); 100-200m NE of old RR trellis. (35-45 individuals in population)
(First report from Niobrara county)

1450m elevation

Aug. 17, 1996

9538

Donald Hazlett

NEBRASKA

Sioux County

Orchidaceae

Spiranthes diluvialis Shev.

Ute lady's tresses orchid

Locally common along Niobrara River: in a field that had been mown and baled 3-4 weeks earlier. Over 1000 individuals occurred in this mown area. The exact location is withheld at the request of the land manager.

(First report of this species from Nebraska)

1450m elevation

August 24, 1996

9541

Donald & Eric Hazlett

NEBRASKA

Sioux County

Orchidaceae

Spiranthes diluvialis Shev.

Ute lady's tresses orchid

Locally common along Niobrara River: a field that had been mown and baled in July. Only 2-3 individuals of hundreds that were seen still had flowers at tip. Exact location is withheld at the request of the land manager.

1450m elevation

Sept. 16, 1996

9648

Donald Hazlett